International Journal of Nursing and Midwifery

Volume 9 Number 6, June 2017
ISSN 2141-2456

Academic Journals

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International Journal of Nursing and Midwifery

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Vol. 9(6), pp. 65-69, June 2017
DOI: 10.5897/IJNM2017.0262
Article Number: 267799B64496
ISSN 2141-2456

http://www.academicjournals.org/IJNM

International Journal of Nursing and Midwifery

Full Length Research Paper

Knowledge, attitude and practice of surgical site infection prevention among post-operative nurses in a tertiary health institution in north-central Nigeria

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Received 11 March, 2017; Accepted 17 May, 2017

Surgical operations are vital procedures in the health care delivery system. Advancement in surgery has played a pivotal role in managing and treating complex health challenges requiring the process. However, the process and procedure involved in surgical operations could significantly endanger the life of the patient. Healthcare associated infections (HAI) pose grave danger to patients and health workers alike. Empirically establishing the level of knowledge, attitude and actual practices of surgical site Infections (SSIs) infection prevention among nurses is therefore an issue for research if the alarming rate of SSIs in developing countries is to be checked. The study adopted cross-sectional survey and the population comprised surgical ward nurses in University of Ilorin Teaching Hospital, Ilorin. Data were generated using self-developed questionnaire with a reliability estimate of 0.88 on the Cronbach alpha scale. These data were analyzed using descriptive statistics of frequency counts and percentages and inferential statistics of Pearson Product Moment Correlation Coefficient at 0.01 alpha. Findings showed that respondents demonstrated relatively high level of knowledge on SSIs prevention, relatively poor attitude towards SSIs prevention and unsatisfactory level of SSIs prevention. When associations among the variables were examined, findings showed that there is positive association between all the variables studies. Findings showed that there is positive and moderate correlation between knowledge and attitude towards SSIs prevention ($r = 0.695$, $p = 0.000<0.01$) as well as between knowledge and practice ($r = 0.570$, $p = 0.000<0.01$). High correlation was however found for attitude and practice of SSIs prevention ($r = 0.763$, $p = 0.000<0.01$). Nurses' level of knowledge does not translate to desired attitude and practices on SSIs prevention. Improving attitude and practice of SSIs through close supervision, patients' rights education, in-service training and provision of supplies and consumables were recommended.

Key words: Surgical site infections, knowledge, attitude, practices, prevention, nurses.

INTRODUCTION

Surgical operations are vital procedures in the health care delivery system and becoming one of the most frequent hospital procedures which is associated with post-operative morbidities (Weiser et al., 2008). Advancement

in surgery has played a pivotal role in managing and treating complex health challenges requiring the process. However, the process and procedure involved in surgery before, during and after the operations could significantly endanger the life of the patient. Healthcare Associated Infections (HAI) pose grave danger to patients and increased workload on health workers which ultimately affect the quality of nursing care (Famakinwa et al., 2014). Surgical site infection (SSI) is one of the most occurring HAI with serious consequence for patients' general condition and survival after a successful surgical intervention (Famakinwa et al., 2014). An SSI can be superficial incisional, deep incisional or organ space infection.

SSI refers to infections that occur as a result of surgical procedure and within thirty days of the procedure or 365 days if there is an implant (Mangram et al., 1999). SSIs are leading cause of HAIs particularly in developing countries (CDC, 2016); the incidence varies from hospital to hospital just as it equally varies from country to country. Available statistics show that incidence is lower in the developed countries where incidence of 2.0 to 6.4% (Anderson et al., 2008) compared to developing countries where incidence has been estimated at between 5.5 and 25% (Lohsiriwat and Lohsiriwat, 2009). Notable consequences of SSIs include but not restricted to prolonged hospital stay, high cost of care, increased psychological stress and trauma for patients and their families, low quality of life, increased risk of morbidity as well as increased risk of death. While some factors associated with SSIs are modifiable, others like age are not thereby calling for increased care among care providers.

However, risks for SSIs are classified into intrinsic extrinsic factors Famakinwa et al. (2014). While the intrinsic factors include advanced age, malnutrition, metabolic diseases, smoking, obesity, hypoxia, immune-suppression, and length of preoperative. Pre-operative skin preparation and skin antiseptics, antibiotic prophylaxis, inadequate sterilization of surgical instruments, surgical drains, surgical hands scrubs, and dressing techniques formed the extrinsic factors. All efforts of infection control among health care providers notwithstanding, infections remain a major unwanted side effect of surgical operation. This unwanted event causes serious harm to patients in both developed and resource constraint countries. The classical statement of Johan Peter Frank, Director of the General Hospital in Vienna around 1800: *Can there be a greater contradiction than a hospital disease: An evil that one acquires where one hopes to loose one's own disease?* Is very much applicable to health care even in this century. The major problem is not the lack of effective surgical precautions and evidence-based guidelines, but possession of knowledge, development of the right attitude and intention to carry out these guidelines to prevent SSIs. Efforts to reduce the frequency and severity of surgical wound infection continue to focus on peri-operative issues, infection control practices in the operating room, surgical site preparation, timing and choice of antibiotics, and physiologic support of a patient during and immediately following the procedure.

The nurses are important members of the surgical care team that stays with the patient round the clock. It is imperative for the surgical nurses to understand the basics of pre and post-operative wound infection prevention and control. The implementation of quality measures including antibiotic prophylaxis, hair removal using a clipper, tight control of pre- and post-operative glucose levels and avoiding hypothermia are all recognized key quality measures in reducing infection (Wick et al., 2008). The timing of surgical prophylaxis and the appropriate use of antimicrobial prophylaxis is an agreed quality indicator and represents a significant intervention in preventing SSIs (Humphreys and Cunney, 2008). An array of studies reported significant drop in the rates of SSIs associated with increased awareness among healthcare workers (Joyce and Nanjaiah, 2009; Eskander et al., 2013). On the other hand, lack of infection prevention and control awareness was found to be associated with poor practices of standard precautions by surgical wards nurses (Mahmud and AbdulSahib, 2011).

Empirically establishing the level of knowledge, attitude and actual practices of SSIs prevention among nurses is therefore an important issue for inquiry. The present study aimed to investigate knowledge, attitude and SSIs prevention practices among nurses in north-central, Nigeria.

MATERIALS AND METHODS

Descriptive survey research design of the correlational type was adopted for this study. The population comprised nurses working at the surgical wards and operating theatres of the University of Ilorin Teaching Hospital Ilorin, Nigeria. A convenience sampling was used to select 250 nurses who were free and willing to participate in the study. Data was collected using a questionnaire with reliability of 0.88 estimated on the Cronbach alpha scale. Participants' knowledge was assessed by 10 question, 2 points were awarded for each correct answer; zero point for incorrect answer while no idea attracted zero point as well. Attitude was assessed using ten questions with the statement constructed along a 4-point scale (strongly disagree to strongly agree). Since the items were negatively worded, strongly disagree attracted 4 points while

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strongly agree attracted 1 point with agree and disagree taking 2 and 3 points respectively. In the same vein, practice was assessed using a-ten item scale on a 4-point scale (very often to never). Two research assistants collected the data using on the spot administration technique. Respondents where requested to read and fill a consent form before given copies of the questionnaire which were filled and collected on the spot. The essence of this administration technique was to avoid the loss of questionnaire. Filled copies of the questionnaires were scrutinized for complete filling and coded into SPSS. The coded data were analysed using descriptive statistics of frequency and percentages and inferential statistics of Pearson product moment correlation coefficient at 0.05 alpha level.

RESULTS

The ages of the respondents ranged from 25 to 51 mean 36 ± 3.7 and 168 (70.6%) were female with Nursing Officer I forming majority (36.1%). The rest respondents were Nursing Officer II (30.3%), Senior Nursing Officer (14.3%), Principal Nursing Officer (13.4%) and Chief Nursing Officer 5.9%. The years of experience of the nurses ranged from 1 to 20 with a mean of 14 ± 3.2 years.

On the knowledge of respondents on prevention of SSIs, 68.1% of the respondents correctly identified contaminated personnel hands as major sources of SSIs in the hospitals, 97.9% also correctly identified the need to wash hands or sanitize the hands after handling soiled linen. On the place of jewelries preventing proper hand washing, only 40.3% of the respondents demonstrated this knowledge with 22.7% having no idea. Findings also showed that 55% of the respondents reported that shaving before surgery reduces the chance of surgical site infections, 25.6% reported that they do not have an idea. More so, 46.6% reported that antimicrobial soap use before operation could reduce SSIs. Again, 45.8% of the respondents also reported that risk of SSIs after shaving is lowest when done shortly before the operation with a higher percentage, 62.2% reporting that application of antibiotic cream to the entry site reduces the risk of infections. Good knowledge of SSIs prevention was demonstrated by 92.4% response that washing hands or sanitizing before simple surgery or caring of surgical wound is important to preventing SSIs. In the same vein, 86.1% of the respondent also reported the need to wash hands before commencing work at the surgery ward.

Respondents' views on prevention of SSIs are represented in Table 1. The results further showed a relatively high practice of surgical wound prevention guidelines as only 15.1% of the respondents reported not washing their visibly soiled hands sometimes. Findings also showed that 71.4% reported using sterile technique to change dressing often, although 28.6% reported this practice just sometimes. It was also revealed that nearly half of the respondents (45%) reported that they sometimes change damp sterile dressing as often as possible. Also, only 16% reported complying with surgical wound guidelines very often with 34% reporting complying with these guidelines often. Again, only 22.3 and 27.3% reported using hand gloves and other protective devices very often and often respectively while 34.9% reported washing their hands before and after caring for a surgical wound very often. Generally, being safety conscious while discharging care for surgical wounds was reported to be practiced very often by only 17.6% of the respondents although 30.7% reported being safety conscious often with 6.3% reporting being indifferent.

The result of the study as shown in Table 2 above revealed that there is positive associations between all the variables studies. Findings showed that there is positive and moderate correlation between knowledge and attitude towards SSIs prevention with an r value of 0.695 and the p value at 0.000<0.001 showed that this association is significant. Similarly, there is also positive and moderate correlation between knowledge and practice at an r value of 0.570 and p value at 0.000<0.01. When association between attitude and practice was tested, findings showed that there is a high level of correlation between the two variables at an r value of 0.763 and p value at 0.000<0.01.

DISCUSSION

The result of the study demonstrated that respondents reported a fairly high level of knowledge on prevention or SSIs. A major issue in prevention of deleterious health outcomes is translation of possessed knowledge into actions. This is especially the case with health care providers whose professional trainings expose them to a body of knowledge on critical health issues. The challenge is therefore the translation of this knowledge to needed actions aimed at preventing negative health outcomes like surgical site infections. Knowing what to do is one thing and actually doing what one knows to do is an entirely different thing. It is equally important to ensure that possessed knowledge is potent enough to stimulate needed attitude to help maximize the possibility of translating what is known into desirable actions. Taking the issue of hand washing as an example, over 68% of the respondents reported knowledge of infection transmission in the hospital through professionals or care providers unwashed hands. But when attitude towards hand washing was investigated in the second research question items only 31.9% demonstrated strong positive attitude towards frequent and correct hand washing. When taking down to actual practice, findings showed that only 8.8% of the respondents reported washing their hands as soon as they report for duties at the ward frequently. This goes down to confirm the assertion that knowledge does not necessarily translates into action. It is however important to state that the findings of the study corroborate earlier findings by Famakinwa et al. (2014) that equally reported relatively high level of knowledge on SSIs prevention among nurses in Obafemi Awolowo Teaching Hospital, Ile-Ife, Nigeria. The result of

Table 1. Attitude towards SSIs prevention.

Items	Strongly agree	Agree	Disagree	Strongly disagree
There is no proof of the importance of the guideline for care of surgical wounds	36 (15.1%)	110 (46.2%)	54 (22.7%)	38 (16.0%)
Guidelines for care of surgical wounds make my work harder	60 (25.2%)	102 (42.9%)	76 (31.9%)	-
Following the guidelines for care of surgical wounds takes too much time	54 (22.7%)	127 (53.4%)	36 (15.1%)	21 (8.8%)
I do not care about guidelines for care of surgical wounds since they are not very necessary	21 (8.8%)	147 (61.8%)	49 (20.6%)	21 (8.8%)
Guideline for surgical wounds makes patient care very cumbersome	80 (33.6%)	101 (42.4%)	45 (18.9%)	12 (5.0%)
We do not have enough sterile dressings so this affect compliance with guideline for surgical wounds care	15 (6.3%)	65 (27.3%)	116 (48.7%)	42 (17.6%)
Since some nurses do not follow the guidelines for surgical wound care, I feel it is not important for me to follow them	36 (15.1%)	63 (26.5%)	98 (41.2%)	41 (17.2%)
Washing of the hands before and after taking care of a surgical wound is stressful	39 (16.4%)	90 (37.8%)	92 (38.7%)	17 (7.1%)
Frequent changing of damp sterile dressing brings undue stress	36 (15.1%)	98 (41.2%)	45 (18.9%)	59 (24.8%)
Using sterile technique while changing incision wound increases nurse stress	33 (13.9%)	54 (22.7%)	98 (41.2%)	53 (22.3%)

Table 2. Associations between knowledge, attitude and SSIs prevention practices.

Practice		Knowledge	Attitude	Practice
Knowledge	Pearson correlation	1	0.695(**)	0.570(**)
	Sig. (2-tailed)		0.000	0.000
Attitude	Pearson correlation	0.695(**)	1	0.763(**)
	Sig. (2-tailed)	0.000		0.000
Practice	Pearson correlation	0.570(**)	0.763(**)	1
	Sig. (2-tailed)	0.000	0.000	

**Correlation is significant at the 0.01 level (2-tailed).

the study also showed relatively poor attitude towards SSIs prevention and this is suspected to affect practice. As earlier stated, knowledge does not translate into positive attitude. Although knowledge is important in shaping right attitude, it is however not certain that knowledge gained will translate into positive attitude. Many barriers and extraneous factors might come into play to whittle down the potency of acquired knowledge in bringing about desired attitude. Since attitude is much more likely to influence behavior than just knowledge, emphasis aimed at bringing about improved SSIs prevention practices might be targeted at helping nurses develop positive attitude towards SSIs prevention. Nurses with poor attitude towards SSIs prevention will be more likely to engage in SSIs prevention practices as equally confirmed by this study that showed a positive and high correlation between attitude and SSIs prevention practices. An important way of improving SSIs prevention practices could therefore be targeted at improving on the attitude of nurses towards the prevention guidelines as this improvement will result in improvement in SSIs prevention practices. This study confirms the findings of Brisibe et al. (2014) that reported similar results among health care providers

working in selected tertiary health institutions in Port Harcourt, Nigeria. On the issue of actual practice of SSIs prevention guidelines, results showed worrisome percentage of respondents who demonstrated lackadaisical attitude and indifference towards the practice of these guidelines. The results showed that a poor percentage of the respondents reported carrying out critical steps in preventing SSIs only sometimes when these practices should be done almost always. This finding corroborates the work of Brisibe et al. (2014) who also reported unsatisfactory level of SSIs prevention practices among health workers in two tertiary health institutions in Port Harcourt Nigeria. Factors relating to shortage of supplies in consumables, lack of in-service training and poor monitoring and supervision were highlighted as causes of unsatisfactory practice of SSIs prevention guidelines

Based on the findings of the study, it is concluded that though nurses working in the surgical wards of the teaching hospital investigated demonstrated evidence of good knowledge of SSIs prevention, the level of knowledge did not translate into desired attitude and practices on SSIs prevention. The results of the study also showed that there is positive, moderate and significant association between knowledge and attitude towards SSIs prevention just as the same relationship exists between knowledge and SSIs prevention practices. Again there is high, positive and significant association between attitude and practice of SSIs prevention. It was therefore recommended that there is need for on the job training for nurses to help re-awaken them to the roles expected of them in protecting and preserving life. Also, there is need for close monitoring and supervision of surgical ward nurses to ensure that they strictly adhere to SSIs prevention guidelines. The authorities of hospitals too should provide on regular basis the necessary consumables and supplies to ensure strict adherence to SSIs prevention guidelines. In the same way, the use of education, information and communication materials need to be conspicuously displaced in and around the ward to help keep nurses on their toes on infection prevention. Lastly, there is need for patients' education and empowerment on their rights and the responsibilities and obligations care providers owe them. This is important to enable them realize when their rights are being trampled upon and their safety threatened by the negligence of care providers.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Vol. 9(6), pp. 70-76, June 2017
DOI: 10.5897/IJNM2017.0265
Article Number: 94970ED64498
ISSN 2141-2456

http://www.academicjournals.org/IJNM

International Journal of Nursing and Midwifery

Full Length Research Paper

Nutrition education during pregnancy: Are final year midwifery trainees ready to offer this service?

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Received 11 April, 2017; Accepted 17 May, 2017

Midwives provide most of the maternity services, including nutritional counseling and education services. In Ghana, there is scarce evidence regarding the competency of midwives in providing sound nutritional advice to pregnant women. Therefore, the aim of this research was to assess the nutritional knowledge levels of final year midwifery students. A descriptive cross-sectional study was conducted, in which 562 final year midwifery students from six Midwifery Training Institutions answered 20 multiple-choice questions on nutritional-related issues during pregnancy. An average score of 9.8 (approximately 49%) was obtained by the respondents. Most (>70%) of the respondents were knowledgeable of the ideal time to start taking folic acid when planning to be pregnant and the effects of high alcohol intake during pregnancy. Key areas that require attention included recommended weight gain during pregnancy, sources and functions of micronutrients, such as folic acid, iron, vitamin C, calcium and iodine during pregnancy, and nutritional management of pregnancy-related conditions like pregnancy-induced hypertension, nausea and heartburn. The findings of this study support other reports that midwives need more training in human nutrition; and it has important implications for professional planning of curricula for midwifery education.

Key words: Midwifery students, nutrition education, diet during pregnancy.

INTRODUCTION

Healthy eating is very critical before, during and after pregnancy. The nutritional status of a woman during the child-bearing stages of life has significant long-term consequences on the health and well-being of the mother, the growing foetus and newborn child (Marangoni et al., 2016; Darnton-Hill and Mkparu, 2015). It is therefore important that reliable nutrition information is given to pregnant women, and that midwives, the major health service providers of maternity care, have the requisite knowledge to execute their roles as nutrition counselors and educators (Elias and Green, 2007). Indeed, studies have established that nutrition education during pregnancy is associated with positive pregnancy outcomes (Streuling et al., 2010). Specifically in Ghana, previous studies have also highlighted the importance of nutritional counseling by health workers (Yawson et al., 2017; SPING/Ghana, 2013).

A systematic review to assess whether health

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professionals had the capacity to provide nutritional advice during pregnancy and if pregnant women were receiving such nutritional counselling services revealed that, generally, women in their reproductive age were not receiving adequate nutrition education during pregnancy. Although healthcare practitioners perceived nutrition education to be important, barriers to providing education to clients included lack of time, lack of resources and lack of relevant training (Lucas et al., 2014).

However, a literature review to explore the extent to which the role of midwives in nutrition education during pregnancy has been reported led to a conclusion that there is limited research available on the role of midwives in nutrition education during pregnancy. The authors therefore recommended that more research is required to explore the educational needs of midwives to enhance nutritional care of pregnant women (Arrish et al., 2014).

It has been asserted that midwives often lack the essential knowledge and skills to provide adequate and reliable nutrition advice to pregnant and lactating women on how to meet increased nutrient requirements during these critical and nutrient-demanding stages of their lives (Morton et al., 2014). Improving the quality of nutrition training of midwifery trainees is vital for building the necessary human resource capacity to provide effective nutrition education and counselling services in order to tackle the public health issue of malnutrition among vulnerable groups in Ghana (Yawson et al, 2017; Sodjinou et al., 2014).

In a review paper, Arrish et al. (2014) asserted that few studies have explored the nutrition knowledge of midwives. This study was therefore undertaken to assess the current status of nutritional knowledge of final year midwifery students who were in their last semester of training in six diploma awarding midwifery training tertiary institutions in Ghana.

METHODS

This was a descriptive cross-sectional study designed to assess the nutritional knowledge of midwifery students at six diploma awarding midwifery training institutions in Ghana. The study was carried out to identify 'gaps' in the nutritional knowledge of these midwifery trainees who were in the last semester of their 3-year training programme.

Study participants

The inclusion criterion for participation was for a study participant to be in the final year of the three- year training programme. Hence only third (3^{rd}) year midwifery students qualified to participate in the study since they had completed more than 75% of their course load required for their training and were more likely to have completed nutrition-related courses in the curriculum. Students in the first (1^{st}) and second (2^{nd}) years were excluded because they had not completed at least 75% of their course work.

Regarding sampling of the respondents after obtaining permission from the principals in the school, all final year students were approached and those who gave their consent to participate in the study signed an informed consent form and were given the questionnaire to complete. Therefore, participation was voluntary. Out of a total number of 571 questionnaires that were administered to students who consented to participate in the study in the six selected Midwifery training schools, 562 completed the questionnaire representing approximately 98.4% of the population. Participants were individually approached to seek for their consent to voluntarily participate in the study. The consenting process entailed thoroughly explaining the purpose of the study, confidentiality and the freedom to opt out of the study without any penalty. After the study had been thoroughly explained to the participants, they were only recruited to participate in the study after they gave their consent by signing an informed consent form. Confidentiality was maintained and anonymity of responses was ensured by avoiding the use of any form of identity of participants.

Data collection

The data was collected between November and December, 2016. A self-administered questionnaire was distributed to students who voluntarily gave their consent to participate in the study after the purpose for the study had been explained to them. The questionnaire used in this study is a modified version of nutritional knowledge questionnaires employed in similar studies among midwives in Australia (Arrish et al., 2016), New Zealand (Elias and Green, 2007) and Sudan (Elkhalifa and Kuppuswamy, 2014).

Information sought from the study participants included demographic data, educational background, knowledge about nutrition during pregnancy and respondents' views regarding the relevance of nutrition as part of their school's curriculum and their ability to thus apply nutritional knowledge in their career as professional midwives.

Quality assurance

Standard procedures were used to ensure accurate and consistent collection of data in each of the six schools. The data was collected by final year health science education university students who were undergoing their teaching practice in these six schools. They were trained on how to explain the purpose of the study to the students and issues on voluntary participation, informed consent, ensuring anonymity and confidentiality of responses given by the study participants.

The questionnaire was also pre-tested among 30 final year students to assess for reliability, clarity and simplicity of the test items at one midwifery training institution not selected for the final study. To ensure that responses given by the students were a true reflection of their knowledge levels, the students were not allowed to send the questionnaire out of their lecture rooms, but had to sit and answer the questions on their own without consulting any textbook or fellow student. Therefore it was ensured that students completed the questionnaire independently in a quiet lecture room setting.

Data analysis

The data was analysed using the Statistical Package for the Social Sciences (SPSS) programme, (version 21.0). Each correct multiple choice question was assigned a score of 1 mark (with a maximum possible score of 20 marks). In addition, the proportion of students who provided correct answers to each question was assessed and presented in tables. Descriptive statistics were run to summarize the data collected; and the results were displayed in frequencies, percentages and means.

Table 1. Information on nutritional education and application of knowledge acquired by midwifery students.

Variable/statement	N	Percentage
Completion of a nutrition –related course at the Midwifery Training College		
Yes	562	100.0
No	0	0.0
Number of nutrition courses studied		
One(1)	530	94.3
Two(2)	32	5.7
Ability to apply nutrition knowledge acquired later as a professional midwife		
Yes	538	95.7
No	24	4.3
If No, reason for inability to apply the knowledge acquired in nutrition		
Knowledge acquired is inadequate	10	41.7
Knowledge acquired sounds abstract	8	33.3
No practical application of the theoretical knowledge was included in nutrition course	6	25.0
Main source of nutritional information		
Nutrition Lessons taught by tutor	472	84.0
Magazines, newspapers	18	3.2
Internet	50	8.9
Television/Radio	8	1.4
Journals	4	0.7
Nutrition Books	8	1.4
Not applicable	2	0.4
Did you ever had an interaction with a nutritionist or dietician when you studied the nutrition course(s)		
Yes	0	0.0
No	562	100.0
Opinion with regard to adequacy of/time allocated for nutrition instruction in their institutions		
Adequate	94	16.7
Not adequate	406	72.3
Do not know	62	11.0
Opinion with regard to the importance of teaching and learning of nutrition courses in NMTC		
Not important	4	0.7
Important	68	12.1
Very Important	490	87.2

RESULTS

All the study participants were females as the profession of midwifery is dominated by females with so few men in this profession. Most of the respondents, 514 (91.5%), were between the ages of 18 and 24 years.

Nutrition education and application of knowledge acquired by study participants

Information on nutrition education and application of knowledge acquired by the surveyed midwifery students are presented in Table 1.

The study revealed that all the study participants, 562 (100.0%) had completed and passed a nutrition course as required in their training. Majority 530 (94.3%) indicated that they had studied one nutrition course. A higher proportion of the respondents, 538 (95.7%), indicated that they had the ability to apply the nutrition knowledge acquired during their training later when they start working as professional midwives. Out of the 24, who indicated that they did not have the ability to apply the knowledge acquired later as professional midwives, most of them 10 (41.7%) pointed out that the knowledge acquired was not adequate, 8 (33.3%) indicated that the knowledge acquired sounds abstract, whereas for 6 (25%), they were not in a better position to apply the knowledge acquired in nutrition because no practical application of the theoretical knowledge was included in nutrition course. Most of the respondents (84.0%) indicated that their main source of nutritional information was from their nutrition course tutor rather than nutrition books or the internet. With regard to their opinion on the

Table 2. Percentage of midwifery students that correctly answered nutrition knowledge questions.

S/N	Abbreviated form of question	Correct answer	N (%)
1	Nutrient strongly associated with the prevention of neural tube defects	B. Folate	280 (49.8)
2	Recommended average weight gain range during pregnancy for a women with BMI of 18.5 to 24.9 kg/m^2	B. 11.3 to 15.8 kg	70 (12.5)
3	Recommended time to start taking a folic acid supplement when planning to become pregnant	A. at least 1 month before pregnancy	420 (74.7)
4	Recommended folic acid intake level for pregnant women	A. 400 mcg per day.	262 (46.6)
5	Not a good source of folic acid	B. Milk	250 (44.5)
6	No need for an increased intake during pregnancy	A. Vitamin A	324 (57.7)
7	Not a reason why a pregnant woman should take adequate levels of vitamin C	C. Needed to prevent microcephaly (small head)	254 (45.2)
8	Not a rich or good food source of iron	C. banana	222 (39.5)
9	Not an importance or role of calcium during pregnancy	C. needed for normal vision/ eye sight	278 (49.5)
10	Nutrient helps to increase absorption of iron from plant food sources	B. Vitamin C	304 (54.1)
11	Advice not recommended to a pregnant woman who complains of nausea morning sickness	B. Drink some liquids at mealtime	312 (55.5)
12	Advice not recommended to a pregnant woman who complains of constipation	C. Reducing one's daily exercise or physical activity level	480 (85.4)
13	Advice not recommended to a pregnant woman who complains of heartburn	A.drinking liquids with meals to relieve burning feeling	322 (57.3)
14	Not a dietary management of Pregnancy-induced hypertension (PIH)	C. Reducing intake of magnesium rich foods in daily diet	302 (53.7)
15	Deficiency can result in megaloblastic anaemia during pregnancy	B.folate deficiency	98 (17.4)
16	Ideal gestation period to screen for gestational diabetes mellitus	B. 24 and 28 weeks	222 (39.5)
17	Nutrient works with calcium to help in the development of a baby's bones during pregnancy	C. vitamin D	218 (38.8)
18	Average amount of iron required by a pregnant woman each day to meet her iron needs	B. 27 mg/day	54 (9.6)
19	Result of Heavy alcohol intake during pregnancy	C. Fetal Alcohol Syndrome(FAS)	488 (86.8)
20	Inadequate intake increases risk of mental impairment and cretinism in newborn baby	C. Iodine	320 (56.9)

relevance of studying nutrition as part of their midwifery curriculum, majority 486 (86.5%) indicated that it is very important to study nutrition as midwifery students.

The percentage distribution of students who gave correct answers to the nutrition knowledge questions is presented in Table 2. The mean score for correctly answered questions for all the study participants was 9.8 (49%) out of the total 20 questions (approximately 49%). Some of these questions assessed respondents' knowledge of the importance of taking folic acid supplements during pregnancy, recommendations on weight gain during pregnancy, importance of micronutrients such as vitamin C, B, calcium, iron, iodine, dietary management of pregnancy-related minor disorders and complications such as heartburn, constipation, pregnancy induced hypertension and effect of alcohol intake during pregnancy.

Three questions were answered correctly by less than 20% of the respondents. One of questions assessed respondents' knowledge of the recommended average weight gain during pregnancy for women with normal/healthy BMI of 18.5 to 24.9 kg/m^2 of which only 70 (12.5%) had it correct. The other question tested respondents' knowledge of the nutrient whose deficiency can result in megaloblastic anaemia during pregnancy, of which only 98 (17.4%) were able to provide the right answer. Again, the third question which evaluated respondents' knowledge on the approximate average iron intake per day during pregnancy was answered correctly by 9.6% of the respondents. Three questions were answered correctly by more than 30% but less than 40% of the respondents. One of the questions required that respondents should identify one out of five food sources given which was not a rich or good

food source of iron, of which 222 (39.5%) provided the right answer. The other question assessed respondents' knowledge on the gestation period in weeks which is ideal to screen pregnant women for gestational diabetes, of which 222 (39.5%) provided the correct answer. The third questionnaire assessed respondents' knowledge on the nutrient that works with calcium to help in the development of a baby's bones during pregnancy, of which 38.8% had it correct.

Five questions were answered correctly by more than 40%, but less than 50% of the respondents. These five (5) questions assessed respondents' knowledge on the nutrient associated with the prevention of neural tube defects, the recommended folic acid intake level for pregnant women, food sources of folic acid, reasons why a pregnant woman should take adequate levels of vitamin C and the importance of calcium during pregnancy. Six (6) questions were answered correctly by more than 50% but less than 60% of the respondents. Some of these six (6) questions assessed respondents' knowledge on the nutrient that helps to increase absorption of iron from plant sources, nutritional advices that must be given to manage pregnancy induced hypertension (PIH), nausea, morning sickness and heartburns. Two (2) questions were answered correctly by more than 80% of the respondents. One of these questions sought to evaluate the knowledge levels of respondents on the dietary advice that must be given to pregnant women who complains of constipation. The other question sought to assess respondents' knowledge on the result of heavy alcohol intake during pregnancy, of which 488 (86.8%) of the respondents provided the correct answer.

DISCUSSION

The results of the present study indicated that the mean score for correctly answered questions for all the study participants was approximately 49%, suggesting that the nutritional knowledge of midwifery students was poor as has been reported in similar studies previously conducted among midwives in Sudan (Elkhalifa and Kuppuswamy, 2014); Australia (Schmied et al., 2011) and the United Kingdom (Lee et al., 2010). The poor performance of the final year students in general in the present study can perhaps be attributed to the little emphasis or priority given to nutrition education during the training of midwives (Arish et al., 2016; Sodjinou et al., 2014). Other factors include the level of nutritional competences exhibited by tutors (Sethuraman et al., 2015) and issues related to the lack of essential aspects of human nutrition in courses taught (Shrimpton et al., 2016). In this study, majority (94.3%) of the final year students indicated that they studied only one nutrition course throughout the entire three year duration of the training programme.

Out of the 20 questions that were asked on maternal nutritional issues during pregnancy, 11 questions were answered correctly by less than 50% of the respondents. With regard to folic acid intake during pregnancy, only 46.6% knew the recommended folic acid intake level for pregnant women. It has been reported based on studies conducted in developing countries that majority of health professionals have insufficient knowledge on benefits, correct dose, particular time when folic acid should be administered to prevent Neural Tube Defects (NTDs) (Abedi et al., 2011) and food sources of folic acid (Demilew and Nigussie, 2017).

With respect to the importance of vitamin C during pregnancy, only 45.2% of the respondents knew the benefits of meeting the recommended intakes of vitamin C during pregnancy. The study also shows that 54.1% knew that vitamin C helps to increase absorption of iron from plant food sources. The fact that only 45.2% of the respondents knew the importance of vitamin C during pregnancy in a country like Ghana where about 42% of Ghanaian women aged between 15 and 49 are anaemic and 66% of children aged between 6 and 59 months are anaemic (Ghana Statistical Service (GSS), Ghana Health Service (GHS), 2015) warrants much attention. This is because of the important role that vitamin C plays in facilitating the absorption of non-heam iron.

With regard to calcium intake during pregnancy, only 49.5% knew about its role during pregnancy. In addition only 38.8% of the respondents knew the nutrient (vitamin D) which works with calcium to help in the development of a baby's bones during pregnancy. Regarding, the importance of iodine during pregnancy, a little over half (56.9%) of the participants knew that inadequate intake of iodine increases risk of mental impairment and cretinism in a newborn baby. Pregnant women have much higher iodine requirements as compared to all other population groups. The fact that midwives lack adequate knowledge about the importance of iodine during pregnancy has implications on the awareness of pregnant women and even their dietary intakes of good iodine food sources.

On the issue of gestational weight gain (GWG), only 12.5% knew the recommended average weight gain during pregnancy for women with healthy BMI of 18.5 to 24.9 kg/m^2. Generally, it has been reported in some studies that generally, midwives give low priority to GWG, lack adequate knowledge in GWG and its management and in most cases fail to educate clients on weight gain management issues (Fieldwick et al., 2014; Willcox et al., 2012).

With respect to knowledge on gestational diabetes mellitus (GDM), only 39.5% knew that pregnant women should be screened for the condition between 24 and 28 weeks of pregnancy. The findings of this study suggest that midwifery trainees might not have been introduced to the need for screening pregnant women to early detect cases of women affected with gestational diabetes. Similarly, it has been reported that midwives knowledge about screening, management practices especially with diet and sensitization of women about gestational

diabetes is low (Utz et al., 2016; Antos et al., 2013).

With regard to Pregnancy Induced Hypertension (PIH), only 53.7% could indicate out of five options given that reducing intake of magnesium rich foods is not a recommended dietary management of PIH. Generally, it has been indicated based on the findings of studies that the knowledge of midwives is deficient regarding management of PIH (Stellenberg and Ngwekazi, 2016; Munirathnamma and Lakshmamma, 2013). Munirathnamma and Lakshmamma (2013) reported that generally midwives are more knowledgeable in the area of nursing management than in the area of dietary management of PIH.

Findings from this study also revealed that majority (91.4%) of the final year midwifery trainees did not know the approximate average iron intake per day during pregnancy. Again, only 39.5% could indicate out of five food sources given (Meat, Spinach, Fish, Banana and Eggs) that banana is not a good food source of iron. This finding supports reports made in a similar study where most of the midwives failed to recognize rich food sources of iron (Elkhalifa and Kuppuswamy, 2014). This finding is worrying and warrants great attention particularly considering WHO reports that more than 40% of pregnant women worldwide are anaemic and that at least half of this anaemia burden is assumed to be due to iron deficiency (WHO, 2017).

Findings from this study demonstrate and reiterate the need for continued education to improve midwifery trainees' nutrition knowledge which will boost their confidence as they carry out their duties. Recommendations include the need to update and strengthen the content of the nutrition curriculum in collaboration with experts in nutrition such as dieticians and public health nutritionists. In addition, developing a maternal nutrition resource toolkit which can be approved and adopted for use by all midwifery training institutions and conducting regular refresher workshops for midwifery tutors who teach nutrition-related courses are also worth considering. It is also worthwhile considering giving midwifery students the opportunity to apply their theoretical knowledge on the field while being mentored by a dietician or a public health nutritionist as part of the curriculum for their training.

Conclusion

Generally, majority of midwifery students who are in their final semester of their three-year training lacked basic knowledge of nutrition requirements during pregnancy. Their poor nutritional knowledge was evident in the fact that less than 50% of them could provide the right answers to most of the questions asked (11 out of 20 questions). Lack of knowledge in areas in maternal nutrition which were evident among the final-year midwifery diploma students include weight gain during pregnancy, role and food sources of critical micronutrients in pregnancy such as iron, folic acid, calcium, vitamin D and vitamin C. Other areas which were deficient in the knowledge levels of the study participants include screening for gestational diabetes, and dietary management of problems such as nausea, heartburn and pregnancy-induced hypertension (PIH) during pregnancy.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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academicJournals

Vol. 9(6), pp. 77-84, June 2017
DOI: 10.5897/IJNM2017.0261
Article Number: CCDD39564500
ISSN 2141-2456

http://www.academicjournals.org/IJNM

International Journal of Nursing and Midwifery

Full Length Research Paper

Feto-maternal outcomes in obstructed labor in Suhul General Hospital, North Ethiopia

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Received 19 February, 2017; Accepted 3 April, 2017

Ethiopia is one of the countries with the highest maternal mortality rates, obstructed labor and its complications being the leading causes of maternal deaths in the country. This study was aimed at assessing feto-maternal outcomes in obstructed labor in Suhul General Hospital, North Ethiopia. Institution based cross-sectional study was carried out from May 1 to August 31, 2014 in Suhul General Hospital. All mothers who had given birth in the hospital during the study period were included in the study. Data were collected by using a pre tested structured questionnaire and checklists, entered into Epi Info version 7.1.2.0 and finally transported in to SPSS version 20 software package for analysis. A total of 660 mothers had given birth in the hospital during the study period out of which 44(6.7%) were diagnosed as obstructed labor cases. More than 89% of the mothers with obstructed labor and about 93% of the babies born to them had developed at least one complication. Eighteen (40.9%) of the babies were stillbirths or had died immediately after delivery. Postpartum hemorrhaged and puerperal sepsis 25(56.8%) each and uterine rupture 11(25%) were the main maternal complications among the mothers with obstructed labor. Cesarean birth (68%), hysterectomy (20%), destructive delivery (7%) and repair of the ruptured uterus with bilateral tubal ligation in 5% were interventions done for the mothers with obstructed labor. Inaccessibility of vehicle road and time the women stayed at health centers before they were referred to the hospital have shown association with poor maternal outcomes in Fisher's Exact test. Prevalence of obstructed labor in Suhul general hospital is high with high rate of maternal and fetal complications. Improving vehicle road accessibility and giving training for health centers delivery case teams on when to refer laboring mother to the hospitals is needed in order to decease proportion of Obstructed labor and it sequels.

Key words: Obstructed labor, Ethiopia, low income country, maternal mortality.

INTRODUCTION

Obstructed labor (OL) is defined as the failure of the presenting part to descend in spite of adequate uterine contractions (Dolea and AbouZahr, 2003). The main cause of obstructed labor is cephalo pelvic disproportion

which is usually a result of under nutrition during childhood and early childbirth resulting in small pelvis (Dolea and AbouZahr, 2003, Al-Harazi, 2006, Fantu, Segni et al. 2010, Ara 2011, Agrawal et al. 2014).

OL is an important cause of maternal death in low income countries (Dolea and AbouZahr 2003). It is also responsible for a significant short and long term maternal morbidities such as sepsis, uterine rupture, hemorrhage, secondary infertility, obstetric fistulae and other neurologic and skeletal complications (Arrowsmith et al., 1996, Wall, 2012). Moreover, the impact of obstructed labor on the lives of the fetuses is very significant and it is responsible for high proportion of perinatal death. Furthermore, survived children suffer from long-term complications like cerebral palsy and developmental disabilities (Lawn et al., 2005, Fantu et al., 2010; Kabakyenga et al., 2011; Bayou and Berhan, 2012). OL has contributed 8% to the estimated 289,000 maternal death occurred in 2013 globally, 99% of which were in low income countries (Dolea and AbouZahr, 2003; Wall et al., 2005; Gibbons et al., 2010; Khooharo et al., 2013).

Reducing maternal death resulting from obstructed labor is considered as an indication for the improvement of the obstetric care system and socio-economic status of one country (Neilson, Lavender et al., 2003). In Ethiopia, obstructed labor is now the leading cause of maternal death since complications of abortion have reduced. OL now causes 13 to 36% of all maternal deaths in the country (Abdella, 2010, Bayou and Berhan, 2012, EMoH, 2012). Despite the problem, little research has been conducted regarding OL in the country and no research has been conducted in the last decade in the study area. This study was therefore aimed at assessing feto-maternal outcomes in obstructed labor in Suhul General Hospital.

MATERIALS AND METHODS

Institution based cross- sectional study was conducted in Suhul General Hospital from 1st of May to August 31, 2014. Sample size was determined by using a single population proportion formula:

$$n = \frac{(\mathrm{Z}\alpha/2)^2 \quad * (p)(1-\mathrm{p})}{\mathrm{w}^2}$$

Where, *n* is sample size required, *p* is estimated proportion of OL among laboring mothers and we took 50% (0.5) to get higher sample size, *w* is maximum tolerable error which is 0.04 and *Z* is value of standard normal distribution (Z-statistic) at 95% confidence level which is1.96.

$$n = \frac{(1.96)^2 \quad *(0.5)(0.5)}{0.04^2} = 600.$$

For possible non response during the data collection time, 10% was added which gave a final sample size of 660.

To get the required minimum sample size all the mothers who had given birth in the hospital from May to August 2014 were included in the study consecutively. The hospital is located in Shire town of Tigray region in north Ethiopia which is about 40 km from Eritrean boarder (14°06'51.03" N 38°18.17" E). The hospital is acting as a referral hospital for the surrounding district hospitals and health centers located in the remote areas of the zone. The proportion of women who give birth at health facilities in the region is 26.7% which relatively higher than the national average which is 16%(CSA, 2014).

Face to face interview was conducted to collect data on socio-demographic status, distance from the hospital, road or ambulance accessibility, diagnosis, maternal and fetal outcomes and interventions done using a pre tested structured questionnaire and checklist.

Three BSc midwives were participated in data collection after getting one day training on how to collect the data. One emergency surgical officer had been supervising the data collectors on a daily bases.

Pretest was conducted on 5% of mothers prior to the actual data collection period. Slight modification was then made to the questionnaire and the checklist. The principal investigator had been reviewing the questionnaires and the checklists every day. Epi info version 7.1.2.0 and SPSS version 20 software package were used for data entry and analysis respectively. Descriptive statistics such as mean and standard deviation were computed and analytic statistical analysis was performed with Fisher exact test.

Ethical clearance was obtained from Ethical Review Board of College of Medicine and Health Sciences, University of Gondar. An official letter of cooperation was written by the University to Suhul General Hospital. The hospital administrator in turn has communicated with the obstetric ward head nurse so that data could be collected in the ward. Informed consent was obtained from each study participants and each study participant was informed about the objective of the study and confidentiality of the information she is giving. The participants were also informed that they have the full right not to participate in the study or to stop participation at any time during the interview.

Operational definitions

Obstructed labor

A labor with the features of obstruction like bandle's ring, excessive fetal head molding or caput, malpresentations, vulvar edema, maternal exhaustion and dehydration in a women either referred form rural health institutions or have been in labor for a long time and diagnosed as obstructed labor by the senior obstetrician of the ward.

Poor maternal outcome

Poor maternal outcomes/complications: Presence of at least one of the undesirable outcomes in the mother like postpartum haemorrhage (PPH), puerperal sepsis, uterine rupture, Vesico-vaginal fistula (VVF), bladder injury, perineal tear, cervical tear and maternal death.

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Table 1. Socio-demographic characteristics of the study participants, Suhul General Hospital, North Ethiopia in August, 2014 (n=660).

Variable	Frequency	Percent
Age (n= 660)		
< 20 years	106	16.1
21 – 34 years	486	73.6
≥ 35 years	68	10.3
Address District (n = 660)		
Indasilassie	279	42.3
Tahtay Koraro	51	7.7
Laylay Adyabo	67	10.2
Tahtay Adyabo	18	2.7
Asgede Tsembla	144	21.8
Medabay Zana	52	7.9
Welqayt/ Tselemt	49	7.4
Occupation (n = 660)		
House wife	542	82.1
Private business	76	11.5
Governmental employee	39	5.9
Others*	3	0.5
Educational status (n = 660)		
Uneducated/unable to read or write	248	37.6
Elementary school (Grade 1 - 4)	108	16.4
Secondary school (Grade 5 - 8)	148	22.4
High school (Grade 9 - 12)	95	14.4
Above high school	61	9.2
Age at first marriage (n = 658)		
< 18 year	379	57.6
18 - 19 years	186	28.3
20 year or above	93	14.1

Others: Daily laborers and housemaids

Poor fetal outcome

Poor fetal outcome/complications: Presence of at least one of the undesirable outcomes in the newborn like birth injury, birth asphyxia, stillbirth, or early neonatal death.

RESULTS

Six hundred sixty mothers had given birth during the study period and participated in this study. The median age of the study participants was 25 year with inter-quartile rage (IQR) of 21 to 29 years. Majority of participants, 606(91.8%) were followers of Orthodox Christianity. More than 98% of them were from *Tigrie* ethnic group. Two hundred ninety eight (45.2%) were rural residents. Six hundred fifty six (99.4%) of the participants were in marital relationship. Concerning the district they came from, most of them, 279(42.3%) were from Indasilassie district followed by *Asgede Tsembla* district, 144(21.8%). Majority (542(82.1%) of the participants economically depend on their husbands.

Nearly three fourth, 248(37.6%) of the study participants had no formal education who cannot read and write while only 61(9.2%) have joined college or university. In case of their husbands, 188(28.7%) were uneducated while 143(21.8%) have educational level above grade 12. Five hundred ten (77.3%) were who grew up in rural area and still living there or had changed their residence to urban area and the rest 150 (22.7) have been urban residents from their childhood. The participants' median age at first marriage was 17 years with interquartile range (IQR) of 16 to 18 years. Concerning the monthly income of their husbands, 146(22.3%) have average monthly income of less than $25 while 324 (49.4%) have a monthly income of above $50 (Table 1).

Thirty two (4.8%) of the mothers had no direct vehicle road access to their home. The maximum distance the participants have travelled to visit the hospital was 140 km. The average time the laboring women had waited for ambulance after calling the focal persons is less than half an hour. The median time the laboring women had

Table 2. Distribution of the study participants in relation to utilization and access to health services, Suhul General Hospital, Shire town, North Ethiopia in August, 2014 (n=660).

Variable	Frequency	Percent
Distance from the hospital (km) (n = 660)		
< 10	313	47.4
10 - 50	284	43.0
> 50	63	9.5
Time to wait after calling ambulance (min) (n=628)		
< 30	598	95.2
30 - 60	22	3.5
> 60	8	1.3
Time to walk on foot to reach vehicle road access (h) (n= 32)		
< 1	9	28.1
1 - 2	14	43.8
> 2	9	28.1
Number of ANC visits (n = 660)		
Less than 4	125	18.9
At least 4	535	81.1
Stay at home before visiting health institutions (h) (n = 589)		
< 1 h	159	27.0
1 - 2	332	56.4
> 2	98	16.6
Stay at health institution before referred to the hospital (h) (n = 327)		
< 8	238	72.8
8 - 12	49	15.0
> 12	40	12.2

stayed at their home after the onset of labor before visiting health institutions was one hour with maximum time of up to 25 h. The average time the mothers who had been referred from other health institutions had stayed at the first health institution was about 4 h with some stayed for more than 70 h (Table 2).

Ten (1.5%) and 115(17.4%) of them have medical and obstetric problems or condition respectively. Post term pregnancy 28(24.3%), hypertensive disorders of pregnancy 24(20.9%), premature rupture of membranes (PROM) 22(19.1%) and ante partum hemorrhage (APH) 14(12.1%) were the main obstetric problems/conditions of the study participants. Forty four out of the 660 (6.7%) study participants were diagnosed as obstructed labor (Table 3).

Most of the participants 445(67.4%) had given birth via vaginal route. The weights of the first babies ranges from 1500 to 5200 g with mean weight of 3117 g (SD = 436.6). Six hundred seventeen (93.5%) of the babies born to the mothers were normal birth weight, 30(4.5%) low birth weight and the rest 13(2.0%) were macrosomic. Caesarean birth was the main intervention done for OL cases (Figure 1). One hundred thirty seven (20.8%) of the babies have at least one problem/complication before they had been discharged from the hospital with birth asphyxia being the main problem encountered in 106(77.3%) of the newborns (Figure 2). Thirty nine out of the 44 mothers with OL (89%) and 41(93.2%) of their babies had developed at least one complication during or after delivery (Figure 3).

Factors associated with poor maternal outcomes

Out of the 44 women with OL, 31(70.4%) had no access to vehicle road from their homes to hospital and absence of access to vehicle road was associated with poor maternal outcomes (p value = 0.02). The second factor which have showed some association with poor maternal outcomes in women with OL is the time the women had stayed at health centers before they were referred to the hospital (p value = 0.05) (Table 4).

DISCUSSION

This study has shown obstructed labor as the main contributor to poor maternal and fetal outcomes. Out of 44 mothers diagnosed with obstructed labor, 39(88.6%) of them have developed at least one complication, PPH and puerperal sepsis being the most common complication each encountered in more than half of the Pakistan where PPH was the main complication of OL

Table 3. Obstetric characteristics of the study participants, Suhul General Hospital, Shire town, North Ethiopia in August, 2014 (n=660).

Variable	Frequency	Percent
Parity (n= 660)		
Primiparous	299	45.3
Multiparous (2- 4)	251	38.0
Grandmultiparous (≥5)	110	16.7
GA at delivery (n = 530)		
Preterm	16	3.0
Term	486	91.7
Post term	28	5.3
Type of the obstetric problem/ condition (n=115)*		
APH	14	12.1
IUFD at admission	3	2.6
Twin pregnancy	18	15.7
Polyhydramnios	1	0.9
Post term pregnancy	28	24.3
Preterm labour	16	13.9
PROM	22	19.1
Hypertensive disorders of pregnancy	24	20.9
Total labour duration (h) (n = 618)		
< 24	567	91.7
≥24	51	8.3
Fetal presentations (n = 660)		
Vertex	573	86.8
Breech	62	9.4
Face	13	2.0
Shoulder	7	1.1
Brow	5	0.8

*One mother can have more than one problems

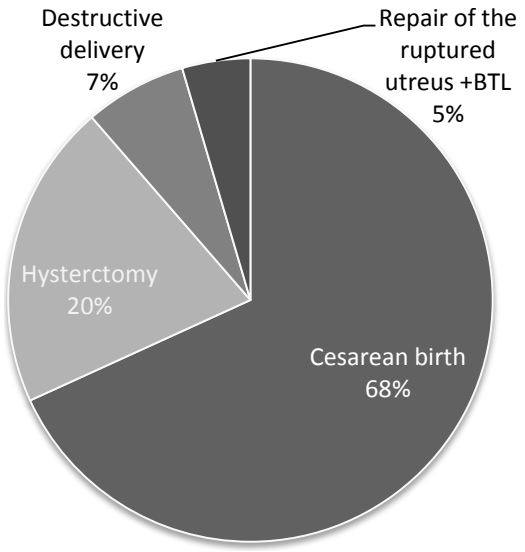

Figure 1. Type of intervention done to manage cases with obstructed labor, Suhul General Hospital, Shire town, North Ethiopia in August, 2014 (n = 44). BTL: Bilateral tubal ligation.

cases followed by puerperal sepsis (Shirin and Nahar 2013). It is also similar with a study done in India where PPH and puerperal sepsis were the main complication among patients with obstructed labour (Omole-Ohonsi and Belga, 2010). This could be due to the fact that women with obstructed labor had been in labor for longer periods after rupture of membrane leading to assessing infection. Manipulations done to manage the cases could also increase the risk of puerperal sepsis. Exhausted uterine muscles fails to contract after prolonged obstructed labor increasing risk of PPH. Rupture of uterus, another complication of OL could have increased rate of PPH in OL cases.

In this study uterine rupture has occurred in 11(25%) of OL cases. This figure is higher than study done in India where only 7.1% of OL cases have developed uterine rupture (Omole-Ohonsi and Belga, 2010). It is however; lower than findings from a study done in Jimma Specialized Hospital in Ethiopia, where uterine rupture has complicated 45.1% of OL cases (Fantu et al., 2010).

This can be attributed to the fact that there is improvement in transportation system in Ethiopia which

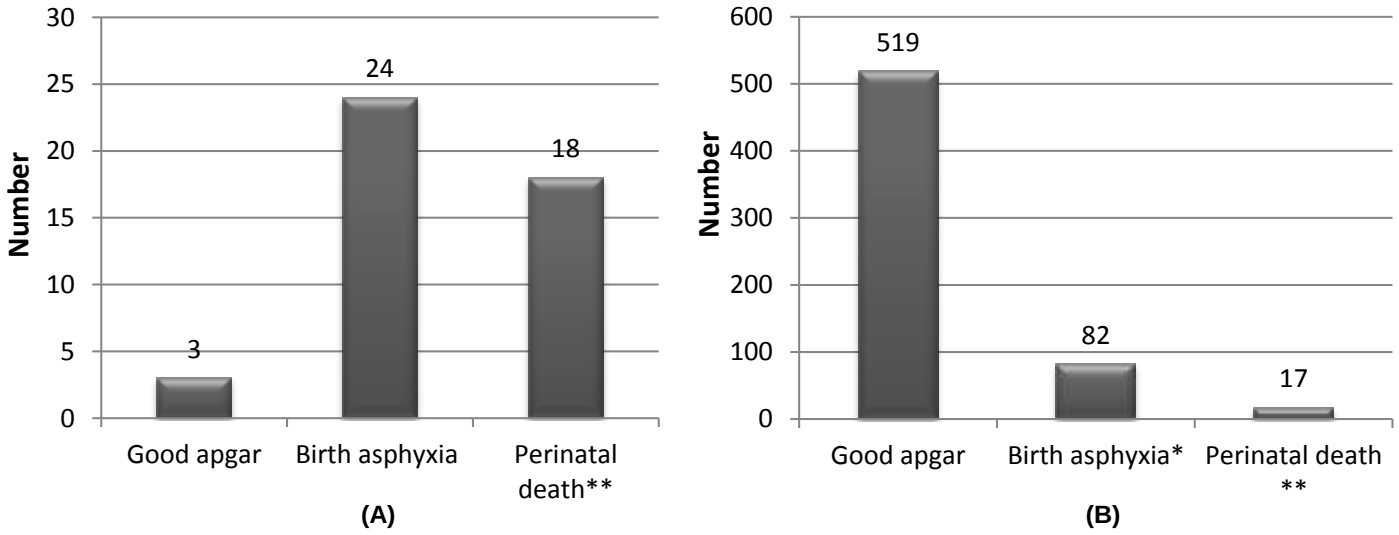

Figure 2. Distribution of birth outcome among the study participants, Suhul General Hospital, Shire town, North Ethiopia in August 2014. (A) OL cases; (B) Non - OL cases. *Two neonates with birth injury included; **Stillbirths + early neonatal deaths that have occurred before discharge from the hospital. One fetus cane have more than one birth outcomes (birth asphyxia and neonatal death.

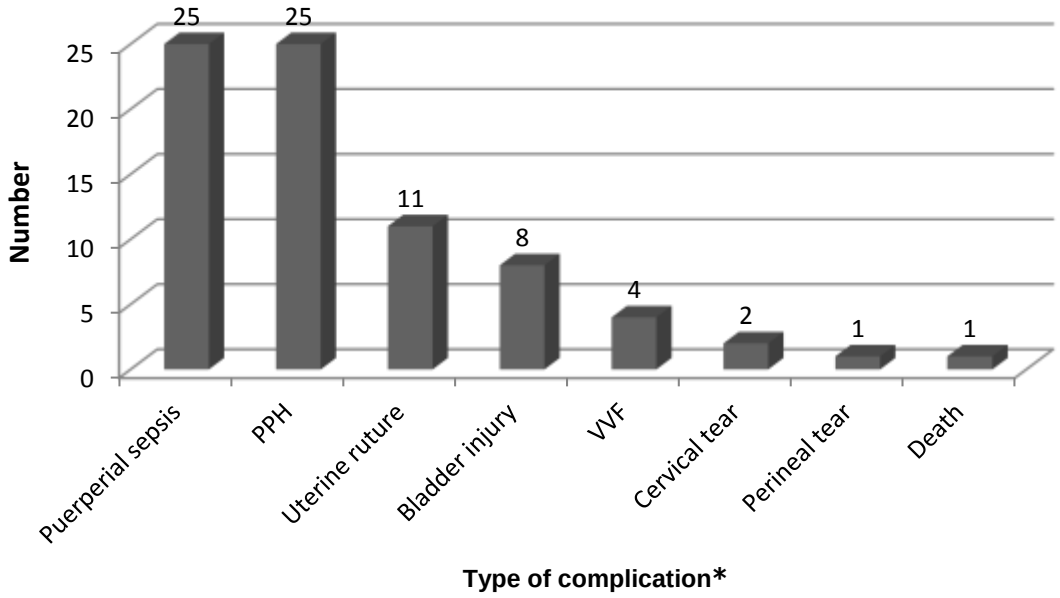

Figure 3. Complications developed by obstructed labor cases at Suhul General Hospital, Shire town, North Ethiopia in August 2014. * One mother can develop more than one complications.

This can be attributed to the fact that there is improvement in transportation system in Ethiopia which could have increased the probability of reaching the hospitals before rupture of the uterus has occurred. The lower figure of Indian study could be due to the difference in the infrastructures from courtly to country.

From this study one mother has died making maternal mortality rate among OL cases to be 2.3%. This is similar to Pakistani study where maternal mortality rate among OL cases was 2% (Shaikh et al., 2013). However; it is slightly higher than Nigerian study and another Pakistani studies where the rate was 1% (Omole-Ohonsi and Belga, 2010; Shazia et al., 2013). This could probably be due to the state at which the patient has admitted to the hospital or availability of drugs and blood products on the day of admission.

Four patients (9.1%) have developed Vesico Vaginal Fistula (VVF) making the rate higher than results from

Table 4. Fisher's exact test analysis of factors associated with poor maternal outcomes among obstructed labor cases, Suhul General Hospital, North Ethiopia in August, 2014.

Variable	Maternal complication/poor outcome		P value
Access to vehicle road	Absent	Present	
Absent	1(3.2%)	30(86.9%)	0.02
Present	4(30.8%)	9(69.2 %)	
Stay at Health centers before referral			
≤ 20 hours	4(25%)	12(75%)	0.05
>20 hours	1(11.4%)	27(88.6%)	

study done in India which was 1.4% and study done in Jimma where the rate was 4.1% (Fantu et al., 2010, Gupta and Porwal, 2012). This could be due to small number of OL cases in this study. It could also be due to difference in time of visiting the hospital after has started as VVF develops about a week after the onset of labor. Out of 44 babies born to women with obstructed labor, 41(93.2%) of the have developed at least one complication. Eighteen (40.9%) of the babies were stillbirths or died immediately after delivery. This is lower than findings from studies done in Nigeria, Pakistan and Jimma Specialized Hospital in Ethiopia where the rate of perinatal loss among OL cases ranged from 50 to 62%(Fantu et al., 2010; Omole-Ohonsi and Belga, 2010; Gupta and Porwal, 2012; Shaikh et al., 2013; Shazia, et al., 2013). However; it is higher than findings from study conducted in six Ugandan hospitals where the rate was 14% (Kabakyenga et al., 2011). This could be due to difference in sample size, differences in availability of equipment to deal with asphyxiated neonates or the status of the fetuses at admission to the hospitals or difference in skill of neonatal resuscitation.

Finding from this study have also revealed that 24(88.9%) of the babies born alive have birth asphyxia (apgar score of less than 7/10 at first minute). This finding is in line with findings from studies done in Pakistan and Jimma Specialized Hospital where 88 to 98% of babies born alive from OL cases have developed birth asphyxia (Fantu et al., 2010, Shazia et al., 2013). However, the rate of birth asphyxia from this study is higher when compared to studies done in Nigeria and India where the rates of birth asphyxia were 37.3 and 35.7%, respectively (Omole-Ohonsi and Belga 2010; Gupta and Porwal, 2012; Shazia et al., 2013). This could be due to difference in skill of assessing apgar score of the neonate's or status of the fetuses at admission or type of intervention done to alleviate the problem.

Conclusions

Prevalence of obstructed labor among mothers who gave birth at Suhul General Hospital is high. Moreover, almost all of the cases with obstructed labor had developed maternal and/or fetal complications. Creating maternity waiting "villages" in a culturally sensitive manner in places where ambulance can access the women so that pregnant women whose homes have no vehicle road access will be admitted to the villages at term is needed. Health professionals working in delivery case teams at health centers need to have training on when to refer/when to send laboring women to the next higher level health institutions. Moreover; strengthening the integrated emergency surgery and clinical midwifery programs to avail emergency obstetric surgeries at health centers in the remote districts of the zone and strengthening universal road access projects including mobilizing men in the community to make each and every house accessed by vehicle is suggested.

Limitations

The first limitation of this study is that it was institution based and therefore did not address the burden of the problem among the women who had given birth at homes where more obstructed labor and its complications including maternal death are expected. Second, the total number of cases with OL is 44 which is a small number to show a reliable association between dependent and independent variables.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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